On A Political Solution to the NIMBY Conflict

By ELI FEINERMAN, ISRAEL FINKELSHTAIN, AND IDDO KAN*

Scale economy in the construction and operation of public facilities, such as landfills, calls for cooperation among communities to build a common facility (Arthur O'Sullivan, 1993). Such a facility is a mixture of a public good and a private bad and, hence, leads to strong opposition by communities to locate it in their vicinity (Bruno S. Frey et al., 1996). This is one of the most serious environmental concerns of recent years, and is known as **NIMBY:** "not in my backyard." In this paper we study the hypothesis that a democratic political process creates an adequate mechanism for the resolution of the NIMBY conflict. The intuitive explanation is simple. A NIMBY conflict is likely to induce lobbying and symmetric pressures by all threatened communities in the relevant region. As is well known (Gene M. Grossman and Elhanan Helpman, 1994), when subject to symmetric pressures, politicians stick firmly to principles and function most efficiently.

The existing literature on the siting of noxious facilities focuses mainly on normative issues, such as welfare-maximizing siting via decentralized community-based mechanisms (e.g., Howard Kunreuther and Paul R. Kleindorfer, 1986; Robert C. Mitchell and Richard T. Carson, 1986; and Deborah Minehart and Zvika Neeman, 2002). Evidently, however, such mechanisms have seldom been practiced (e.g., Stephen K. Swallow et al., 1992). The current study adopts a positive approach, integrating a political-economic framework with a model of a competitive real estate market. In the theoretical section, a government of a linear two-city economy determines the location of a noxious facility, which affects the equilibrium in the real estate market and induces the spatial distributions of price and population. The government is subject to political pressures by city-level lobbies of landowners (both landlords and home owners).

In general, the political equilibrium and the socially optimal siting differ. However, the more equitable the distribution of landownership in the region, the smaller the difference. At the limit, when property distribution is perfectly equitable and all cities participate in the political arena, the government locates the facility at the socially optimal site. The analysis proceeds by identifying additional conditions under which the political equilibrium siting coincides with the socially optimal location and, with an empirical analysis.

In the empirical section, the theoretical framework is extended to account for a multiple-city region, and is calibrated to assess the prospects of the political system for resolving the NIMBY conflict in the context of landfill-siting in Israel. It is shown that if all cities in the region form political lobbies and the politicians are not extremely corrupt, the political siting is close geographically to the socially optimal location, and the difference entails a less than 0.1 percent reduction in social welfare. Moreover, even if the formation of lobbying in the region is incomplete, as long as the weight the politicians assign to social welfare is larger than 0.7, the proximity of the politically and socially optimal locations is preserved. We interpret the above results as supportive of the hypothesis of an effective political solution to the NIMBY conflict.

I. The Economy

Consider a two-city, unit interval region, where Cities 1 and 2 are located at the extremes, 0 and 1, respectively. The cities are populated by N identical households. The economy is open, except for migration. Landowners, either absentee or residents of the region, own land

* Department of Agricultural Economics and Management, Faculty of Agricultural, Food and Environmental Quality Sciences at The Hebrew University of Jerusalem, P.O. Box 12, Rehovot 76-100, Israel (e-mail: feiner@agri.huji.ac.il; finkelsh@agri.huji.ac.il; kan@agri.huji.ac.il). We would like to thank Yakir Plessner and two anonymous referees for valuable suggestions. We also wish to thank participants in seminars at The Hebrew University of Jerusalem, Virginia Tech, and Wageningen University.

and are the suppliers of housing. Housing supply in each of the cities, S^i $i = 1, 2$, is inelastic. A noxious facility like a landfill is located at a point $x \in (0, 1)$. The environmental quality index in each city, $0 \le e^i(d^i) \le 1$, is an increasing, twice differentiable and concave function of the city's distance from the noxious facility, d^i ($d^1 = x$, $d^2 = 1 - x$).

A. *Households' Behavior*

The utility of the representative household living in city i is defined over a composite consumption good, z^i, with a perfectly elastic supply, which is taken as a numeraire, and over its consumption of housing services: $q^i = e^i h^i$, where h^i denotes home size. Utility is given by

$$U^i = z^i + u(q^i);\ i = 1, 2, \tag{1}$$

where u is increasing, strictly concave, and twice differentiable.[1] We assume linear transportation costs and that the amount of waste produced by each city is proportional to its residential area. Therefore, total annual cost of transporting the waste of the ith city is given by $tS^i d^i$, where $t > 0$ is the annual transportation cost per unit of housing area times a unit of distance. The cost is recovered via uniform state/regional tax: $T = \frac{t}{N}(S^1 d^1 + S^2 d^2)$. Thus, a household's budget constraint is:

$$I = z^i + h^i p^i + T;\ i = 1, 2, \tag{2}$$

where I is an exogenously given annual income and p^i is the per-unit rental housing price (hereafter, housing price). Housing price includes local taxes, which vary across cities, but are independent of the facility location.

A household will reside in a city with the lowest ratio, $r^i = \frac{p^i(d^i)}{e^i(d^i)}$, which can be thought of as the price of housing services in the ith city. In addition, the household allocates its limited budget between consumption of housing services and other goods. Maximizing (1), subject to (2), yields the demand relations:

$$q^i = \left(\frac{du}{dq}\right)^{-1}(r^i) \equiv D(r^i); \tag{3}$$

$$z^i = I - T - q^i r^i;\ i = 1, 2,$$

and the household's indirect utility function:

$$V^i = I + u(D(r^i)) - r^i D(r^i) - T;\ i = 1, 2. \tag{4}$$

B. *Spatial Equilibrium*

The competitive equilibrium in the housing market is characterized by three conditions, which determine the spatial distributions of prices, population, and dwellings. First, the housing supply in each city equals demand:

$$S^i = n^i h^i \Leftrightarrow S^i e^i = n^i D(r^i);\ i = 1, 2, \tag{5a}$$

where n^i is the equilibrium number of households residing in the ith city. Second, households are indifferent as to which city they reside in (no migration condition):

$$r^1 = r^2 \equiv r. \tag{5b}$$

Finally, the two cities' populations must add up to the region's population:

$$N = n^1 + n^2. \tag{5c}$$

Substituting (5b) into (5a) and the resultant expression into (5c) yields a single equation,

$$S^1 e^1(x) + S^2 e^2(x) = N \cdot D(r), \tag{6}$$

which summarizes the equilibrium relations between r and x.

From (5b) and the definition of r it follows that

$$p^i(d^i, x) = r(x) e^i(d^i);\ i = 1, 2. \tag{7}$$

This is the hedonic price function, which relates

[1] A more general formulation of the utility, $u(h, e)$, is possible, but does not alter the main results and entails awkward arithmetics.

the housing price to the city's distance from the facility, d^i, and to the facility location, x. It can also be interpreted as the residents' demand for an increase in the distance. Differentiating (7) with respect to x yields:

$$\text{(8)} \quad \frac{\partial p^1}{\partial x} = r_x e^1 + r e^1_{d^1}, \text{ and } \frac{\partial p^2}{\partial x} = r_x e^2 - r e^2_{d^2},$$

where subscripts denote partials. Thus, the effect of shifting the facility's location on housing prices is composed of two components. The first, $r_x e^i$, is a general-equilibrium global effect: the change in x shifts the entire price distribution. Completely differentiating (6) we get

$$\text{(9)} \qquad r_x = \frac{S^1 e^1_{d^1} - S^2 e^2_{d^2}}{N D_r}.$$

Recalling that $D_r < 0$, (9) implies that $\text{sgn}(r_x) \neq \text{sgn}(S^1 e^1_d - S^2 e^2_d)$, and that the general-equilibrium effect in (8) may be either positive or negative.

The second term, $r e^i_{d^i}$, is of a local nature. A city located further away from the noxious facility enjoys a better environmental quality. The local effect is nonnegative and decreasing. The range for which it is positive defines the NIMBY phenomenon. Empirical studies (e.g., Tamir Goren, 1997) suggest that in the case of a landfill, the NIMBY effect extends to a radius of about ten miles. Theoretically, NIMBY is accommodated by assuming that $r e^i_{d^i} > 0 \ \forall \ d^i \in (0, 1)$. The observable inverse elasticity of the demand for distance from the landfill is $\eta^i \equiv \left. \frac{d^i}{p^i} \frac{\partial (p^i)}{\partial d^i} \right|_{r = const}$. The NIMBY assumption implies that $\eta^i > 0 \ \forall \ d^i \in (0, 1)$. We denote $\hat{\eta}^i \equiv \eta^i - \tau^i$, where $\tau^i \equiv \frac{td^i}{p^i}$ is the share of the transportation cost per unit of housing in the housing price. The elasticity $\hat{\eta}^i$ is the observable hedonic elasticity in economies where each household bears the cost of transporting its own waste.

II. Siting Decisions

The socially optimal site maximizes the total annual economic surplus in the economy,

$$\text{(10)}$$
$$W^S(x) = n^1 V^1 + p^1 S^1 + n^2 V^2 + p^2 S^2$$
$$= N[I + u(D(r))] + tx[S^2 - S^1] - tS^2,$$

subject to the competitive equilibrium condition in (6).

PROPOSITION 1 (Optimal Siting): *Assuming an interior solution to the siting problem, the socially optimal location, x^s, that would have been chosen by a benevolent government, is given by*

$$\text{(11a)} \qquad \frac{x^s}{1 - x^s} = \frac{R^1 \hat{\eta}^1}{R^2 \hat{\eta}^2},$$

where $R^i = p^i S^i$ is the property value in city i.

PROOF:

The first-order condition for maximizing (10) subject to (6) is given by

$$\text{(11b)} \quad \frac{\partial W^S}{\partial x} = t(S^2 - S^1) + N r D_r r_x = 0.$$

Substituting (9) into (11b) and rearranging yields (11a). The second-order condition, $r_x(S^1 e^1_{d^1} - S^2 e^2_{d^2}) + r(S^1 e^1_{d^1 d^1} + S^2 e^2_{d^2 d^2}) < 0$, is assured by the concavity of e^i, $i = 1, 2$, and (9).

From inspection of (11b), it is apparent that the siting decision leads to a trade-off between environmental quality and transportation costs. Shifting the facility away from City 1 towards City 2 reduces the environmental externalities in the first and increases them in the latter. At the same time, transportation costs increase in City 1 and decrease in City 2. Optimal siting is achieved at a location where the two cost types are optimally traded; the marginal changes in aggregate environmental quality and total transportation costs are equal.

Equation (11a) characterizes the optimal site in terms of empirically observable quantities. It resembles Ramsy's inverse elasticity rule for optimal taxation. Like the introduction of a tax, the construction of a public facility serves to produce a public good, but creates a local loss of welfare that is proportional to the inverse of the (net) demand elasticity. The resulting rule for optimal siting is simple: the ratio of the distances should be equal to the inverse ratio of the net hedonic demand elasticities, each scaled by the corresponding housing value.

The government in our analysis is, however, a political entity rather than a benevolent planner, and its utility is affected by both social welfare and political rewards. Consequently, the location of the facility reflects the interests of the participants in the political arena and can be characterized as if it was maximizing a political support function—a weighted sum of social welfare and lobbies' welfare. The microfoundations for a political support function are provided by Pinhas Zusman (1976) who describes policies as a solution to a Nash bargaining game between lobbies and politicians, by Grossman and Helpman (1994) who characterize policies as a perfect Nash equilibrium in a menu auction game, and by Finkelshtain and Yoav Kislev (1997) who portray policies as an efficient contract of politicians and interest groups.

Following most political economic studies, lobby formation is taken to be exogenous. In specifying which groups will participate in the lobbying process we follow, however, Devashish Mitra's (1999) formal analysis of endogenous lobby formation. In particular, according to Mitra's criteria, landowners are likely to get organized in a political lobby, whereas tenants do not. This is so because intercity migration is costless, implying that inherent conflict does not arise between tenants of different cities, and effective lobbying requires the organization of all tenants in the region. This is a large group of households, which are geographically dispersed and hardly affected by siting policies (see Section III). In contrast, landowners in a specific city are organized in a relatively small, geographically concentrated, group with large wealth, which is highly sensitive to siting decisions. Moreover, as documented in Deborah Shmueli and Dalit Gasul (1999), a landowner lobby in a specific city is often assisted by existing local organizations, such as the city council and developer associations. These are the precise characteristics, listed by Mitra, to identify groups that are likely to get organized. This leads us to assume that landowners will form political lobbies, while tenants remain unorganized.

Let $0 \le \beta^i \le 1$; $i = 1, 2$, be the proportion of land owned by landowners who are members of the ith city lobby, and let $\nu^i \le n^i$ be the *number* of *organized* landowners who reside in the region. The aggregate annual welfare of the lobby members, gross of political contributions and local taxes, is

$$W^i(x) = \beta^i S^i p^i(d^i) + \nu^i[I + u(D(r(x))) - r(x)D(r(x)) - T(x)]; \quad i = 1, 2. \tag{12}$$

The political equilibrium siting, x^P, is the solution to

$$\max_{x \in (0,1)} \{W^P \equiv (1-\gamma)W^S + \gamma(W^1 + W^2), \text{ subject to (6)}\}, \tag{13}$$

where $\gamma > 0$ is the weight that politicians assign to political contributions. Assuming an interior solution to (13), the political siting is characterized via the first-order condition:

$$\frac{\partial W^P}{\partial x} = (1-\gamma)\frac{\partial W^S}{\partial x} + \gamma \sum_{i=1}^{2} [\beta^i S^i p_x^i - \nu^i(r_x D + T_x)]. \tag{14a}$$

The political equilibrium site can be described in terms of observable quantities. Let $\nu = \dfrac{\nu^1 + \nu^2}{N}$ be the proportion of organized landowners who reside in the region, and $\alpha = \dfrac{\beta^1 n^1 + \beta^2 n^2 - \nu^1 - \nu^2}{N}$ be the proportion of organized but absentee landowners. We denote by $\eta^D = \dfrac{r}{q}\dfrac{\partial D(r)}{\partial r} \equiv \dfrac{p^i}{h^i}\dfrac{\partial h^i(p^i)}{\partial p^i}$ the price elasticity of the demand for housing services, which equals the observable price elasticity of housing demand.

Algebraic manipulation of (14a) yields Proposition 2.

PROPOSITION 2 (Political Siting): *Assuming that the political equilibrium lies in the interior of* [0, 1], *then the government's chosen site,* x^P, *is given by*

$$\text{(14b)} \quad \frac{x^P}{1-x^P} = \frac{\left[1-\gamma+\gamma\left(\beta^1+\frac{\alpha}{\eta^D}\right)\right]R^1\eta^1-(1-\gamma-\gamma\nu)\tau^1R^1}{\left[1-\gamma+\gamma\left(\beta^2+\frac{\alpha}{\eta^D}\right)\right]R^2\eta^2-(1-\gamma-\gamma\nu)\tau^2R^2}.$$

Condition (14b) reflects the inherent conflict between the interests of organized landowners and those of the whole society. When γ vanishes, (14b) reduces to the optimal siting rule. To grasp the intuition behind this result, suppose that transportation costs are negligible. Then, the political siting formula is again an inverse elasticity rule, but now each elasticity is being scaled by $\gamma\left(\beta^i+\frac{\alpha}{\eta^D}\right)$. Thus, ceteris paribus, in comparison to the optimal site, the city with better political organization (larger β^i) pushes the facility further away towards the other city, in order to protect its members' property values.

In addition to the local interest, all landowners' lobbies have a common global interest in raising housing prices in the economy. Getting the facility closer to a city diminishes the environmental index in the city. The effective housing supply in the economy, $e^1h^1 + e^2h^2$, is therefore reduced, which raises prices. The magnitude of this effect is inversely related to the absolute value of the demand elasticity η^D. This global interest may work in concert with, or in contrast to, the local one and is mitigated if many of the landowners are residents of the region and care for the total economic surplus in the housing market rather than for just landowner revenues. In the extreme case, when all residents are home owners, α vanishes and only the local interest affects the political siting.

Since the focus of our analysis is the examination of the political process as a siting mechanism, we use the characterization of the political equilibrium in equations (13)–(14b) to study the circumstances under which the political and optimal locations coincide.

COROLLARY: *The following are alternative sufficient conditions for the coincidence of the political equilibrium and socially optimal siting:*

(*a*) *the existence of a benevolent government* ($\gamma = 0$);
(*b*) *a symmetry in political organization* ($\beta^1 = \beta^2$) *and either* (*1*) *all lobby members are residents* ($\alpha = 0$), *or* (*2*) *housing demand is perfectly elastic, or* (*3*) *transportation costs are negligible* ($\tau^1 = \tau^2 = 0$);
(*c*) *all lobby members are residents* ($\alpha = 0$), *and either transportation costs are negligible* ($t = 0$) *or cities are of identical size* ($S^1 = S^2$).

The corollary identifies several situations with a *complete political internalization* of the negative externalities and is valid also in multi-city cases. Unfortunately, however, none of the sufficient conditions offered by the corollary is met by the Israeli reality. We therefore used the Israeli data to empirically assess the paper's main hypothesis, namely that the political process is capable of efficiently resolving the NIMBY conflict.

III. Landfill Siting in the Center and South Regions of Israel

In this section we analyze the siting of a central landfill in Israel. Daily waste production in Israel amounts to 12,000 tons and is growing at an annual rate of 3 percent, exceeding the rate of GNP growth. The waste-treatment system is in a period of transition. In 1997, the base year for our analysis, the waste was disposed of in approximately 350 old and relatively small landfills, most of which did not meet Western environmental standards and were located a short distance from the municipalities they served. The authority to locate landfills in Israel is in the hands of the ministries of the interior and environmental quality. To reform the aged system, these ministries instituted a national waste disposal plan ("TAMA 16"), designed to dramatically reduce the number of landfills and to dump the garbage in five (or less) large, modern facilities.

However, due to intense protests from local landowners provoked by the NIMBY phenomenon, the government has failed to site most of these new waste facilities. Successful lobbying against the permanent siting of a central landfill in Duda'im, just a few miles south of the city of Be'er Sheva (Figure 1a), is a remarkable example of this (Shmueli and Gasul, 1999). The lobby's members, composed of landowners, developers, and representatives of all political parties in the city council, cited fear of reduced environmental quality and value of the city's real estate as important reasons for their opposition. Additional examples of landowners' campaigns against the siting of landfills near cities in central Israel have been documented by Eran Feitelson (2001).

The following analysis focuses on the siting of a landfill designed to serve central and southern Israel. In particular, we consider the 33 major cities in this area, as listed in Table 1. In 1997 those cities were populated by 980,065 households (around 3.1 million people) and accounted for more than 72 percent of the national waste output.

A. *Calibration*

Calibration requires an adjustment of the theoretical model to account for a multiple-city region. Specifically, the equilibrium pricing conditions (6) and (7) can be rewritten as:

$$r = \frac{p^i}{e^i};\ i = (1, \ldots, 33);\ \sum_{i=1}^{33} s^i e^i = ND(r). \tag{15}$$

Data of the population and dwelling distributions in the region, as well as housing prices including local municipal taxes, and the distance of each city from the nearest landfill are readily available and are reported in Table 1. Calibration also requires the specification of functional forms to represent preferences and environmental technology, taking into account intercity variability. We commence with the latter. Let

$$\frac{e^i(d^i)}{\bar{e}^i} = \begin{cases} a + c\ \ln(d^i), & \text{if } d^i \le \bar{d} \\ 1, & \text{otherwise,} \end{cases} \tag{16}$$

where a and c are positive constants, d^i is the distance between the center of the ith city and the closest landfill and $\bar{d}$ denotes the maximum radius to which the negative environmental impact of the landfill extends. The maximal potential environmental quality in the ith city, $\bar{e}^i$, obtained when there is no landfill within a radius of $\bar{d}$.

The calibration of the parameters of $e^i(d^i)$ follows Goren (1997) and Environmental Management and Consulting (1996), who estimate the impact of landfills' proximity on housing prices in 18 Israeli cities using hedonic price methods. The results were verified through a contingent valuation study. Goren estimates that $\bar{d} = 15{,}000$ m (m = meters), $t = \frac{\$}{\text{m}^3 \times \text{year}}$ 1.5×10^{-6}, and that the ratio of the price of a house located at a distance of d^i meters to the price of an otherwise identical house situated at 15,000 m from the facility is:

$$\frac{p^i(d^i)}{p^i(15{,}000)} = \begin{cases} 0.0076 + 0.1032\ \ln(d^i), \\ \quad \text{if } 1{,}000 \le d^i \le 15{,}000 \\ 1, \\ \quad \text{otherwise.} \end{cases} \tag{17}$$

Equations (15), (16), and (17) imply that $\forall\ d^i \in$ [1,000 m, 15,000 m]:

$$\frac{e^i(d^i)}{\bar{e}^i} = \frac{p^i(d^i)}{p^i(15{,}000)} = 0.0076 + 0.1032\ \ln(d^i). \tag{18}$$

Thus, our estimates for a and c are 0.0076 and 0.1032, respectively. This specification implies that the hedonic price elasticity depends only on d^i and for $d^i \in$ [1,000 m, 15,000 m]: $0.10 \le \eta^i \le 0.14$, $i \in (1, \ldots, 33)$. The (local) impact of a shift in the landfill location on housing values may be significant: on average, a kilometer of additional distance raises prices by 1.9 percent. This result agrees with landfill

TABLE 1—CHARACTERISTICS OF THE 33 MAJOR CITIES IN THE CENTRAL AND SOUTHERN REGIONS OF ISRAEL (1997 DATA)

City	Longitude	Latitude	d^i (m)	$p^i(d^i)$ (\$/m^2-yr)	$e^i(d^i)$	S^i (square meters $\times 10^3$)	n^i (number of households $\times 10^3$)	β^i (percent of S^i)	$\nu^i/n^i \times 100$
Arad	171	74	2,828	50.2	0.33	749	3.2	89.3	65.7
Ashdod	118	135	3,512	73.2	0.46	3,649	23.6	86.5	70.7
Ashqelon	110	120	4,000	61.4	0.38	2,407	13.3	79.9	66.8
Bat Yam*	127	158	2,063	94.7	0.64	4,703	39.6	96.8	77.0
Be’er Sheva	130	73	2,122	60.0	0.40	4,674	25.2	82.9	65.8
Bene Beraq*	134	166.5	6,269	117.6	0.70	3,267	34.0	98.0	73.4
Bet Shemesh	148.5	128.5	2,058	67.7	0.46	651	4.0	81.7	66.3
Dimona	153	54	1,726	40.2	0.28	1,025	3.4	68.8	58.9
Giv’atayim*	133	162.5	3,041	145.1	0.94	2,041	26.6	99.5	72.4
Herzeliya*	133	175	2,236	113.9	0.76	2,788	28.1	96.9	75.9
Hod Hasharon*	140	173.6	2,912	91.2	0.59	849	6.9	96.1	76.2
Holon*	131	158	1,397	97.5	0.70	5,333	46.7	97.0	78.7
Jerusalem	170	130.5	1,975	133.3	0.91	15,669	186.7	96.4	64.8
Kefar Sava*	142.5	176	1,967	95.7	0.65	1,999	17.3	95.7	73.3
Lod	140	151	1,647	70.3	0.49	1,369	8.6	84.2	76.3
Modi’in	150	146	7,280	67.7	0.39	1,500	15.0	90.0	90.0
Nes Ziyyona	131.5	148.5	2,186	86.0	0.58	652	5.1	95.1	79.4
Netanya	137.7	193	2,911	88.6	0.57	4,687	36.1	95.7	72.6
Or Yehuda*	137	160	1,947	78.8	0.54	613	4.4	94.8	86.9
Petah Tiqwa*	140	165.5	2,127	92.6	0.62	4,704	39.0	96.3	77.0
Qiryat Gat	128.5	113	2,062	60.2	0.41	1,298	6.9	78.8	57.3
Qiryat Mala’hi	127	127	2,000	60.2	0.41	500	4.8	78.9	80.9
Qiryat Ono*	137	163.3	2,475	112.8	0.75	783	8.0	97.3	78.5
Ra’anana*	137.8	176.7	3,448	121.5	0.77	1,617	17.5	96.6	74.5
Ramat Gan*	133	164.6	5,124	135.6	0.82	5,060	61.2	98.7	71.7
Ramat Hasharon*	135.1	172.6	3,126	140.8	0.90	1,166	14.7	98.1	78.5
Ramla	137	148	1,949	65.2	0.44	1,492	8.7	87.6	79.6
Rehovot	132	144.5	1,964	85.2	0.58	2,643	20.2	96.3	73.7
Rishon Leziyyon*	132	152.4	3,439	90.1	0.57	4,816	39.2	97.3	79.2
Rosh Haayin	147	166.7	2,181	88.5	0.59	789	6.3	98.6	81.4
Tel Aviv*	129.5	164	4,700	163.5	1.00	15,468	221.2	95.2	58.0
Yavne	125	143	1,612	65.2	0.46	724	4.2	94.0	81.7
Yeroham	143	44	2,571	32.7	0.22	260	0.6	64.6	58.7
Sum						99,943	980.1		

Notes:
* Cities included in the lobby of the Tel Aviv metropolitan and its surroundings.

d^i = distance from the local-landfill that served the city in 1997.
$p^i(d^i)$ = rental price, including local taxes.
$e^i(d^i)$ = environmental index.
S^i = housing area.
n^i = existing households’ population.
β^i = percentage of housing owned by private landowners.
$\nu^i/n^i \times 100$ = percentage of private landowners residing in the city.

effects estimated in the United States (Stephen Farber, 1998).

Continuing with the calibration, equilibrium in the real estate market entails $r = \frac{p^i(d^i)}{e^i(d^i)} = \frac{p^i(15{,}000)}{\bar{e}^i}$. We normalize $\bar{e}^1 = 1$, where the reference city, $i = 1$, is chosen to be Tel Aviv, the city with the highest housing prices in Israel.

Employing this normalization, we find the price of housing services: $r = \frac{p^1(d^1)}{0.0076 + 0.1032 \ln(d^1)} = \frac{\$}{m^2 \times \text{year}}$ 186.

Households' preferences are represented by a linear demand function for housing services: $D(r) = A - Br$. To estimate A and B, recall that $q^i = h^i e^i$, and hence, the price elasticity of demand for housing services equals the observable price elasticity of housing demand: $\forall\ i \in \{1, ..., 33\}$, $\eta^D \equiv \frac{r}{q}\frac{\partial D(r)}{\partial r} = \frac{p^i}{h^i}\frac{\partial h^i}{\partial p^i}$. Employing a structural econometric model of the Israeli housing market, Moshe Bar-Nathan et al. (1998) estimate $\hat{\eta}^D = -0.3$, implying $\frac{-Br}{A - Br} = -0.3$. Moreover, the equilibrium conditions in (15) yield a second equation in A and B, namely $A - Br = \frac{1}{3.64 \cdot 10^9} \sum_{i=1}^{33} S^i(p^i(d^i))$. Solving the two equations we calculate $\hat{A} = 74.54$, $\hat{B} = 0.0926$.

To examine the plausibility of the calibration procedure, the predicted population distribution in equilibrium, $\hat{n}^i$, is compared with the actual one in the region, n^i, $i \in 1, ..., 33$. We find that the correlation coefficient between the two equals 0.97.

B. *Optimal Siting*

Following the declared goal of the Israeli government and the actual emerging policy, we consider the replacement of all the landfills that existed in the region in 1997 with a single, large, and modern one. The optimal location of such a facility would maximize total economic surplus in the regional housing market:

(19)

$$W^S(x) = 980{,}065[30{,}003 - 0.0463r(x)^2] - 1.5 \times 10^{-6} \sum_{i=1}^{33} S^i d^i(x).$$

Total social welfare, W^S, for every possible location of the landfill in the entire region is depicted in Figure 1a. The optimal siting is depicted in Figure 1a as point S, at longitude = 135.0 and latitude = 128.9. This is located in an open space, defined by the Israeli Ministry of Environmental Quality as a "low-sensitivity area" suitable for development, and at an approximately equal distance from Tel Aviv and Jerusalem, the two metropolises in the region. Total annual economic surplus (net of the cost of transporting the waste) originating from housing services is then \$29.2 billion.

When the landfill is located at S, the only cities affected by its negative externalities are Qiryat Mala'hi and Bet Shemesh, which are located less than 15 kilometers from the designated site. The landfill entails an annual total loss of \$0.9 million of economic surplus in the housing markets of those two cities. The location of the landfill in a relative vicinity of both metropolises results in moderate transportation costs, amounting to \$4 million, annually.

Thus, a carefully situated landfill reduces environmental damage to a minimum, while transportation costs are kept low. On the other hand, inefficient siting near populated residential areas may diminish welfare significantly. This is exemplified by a comparison of the optimal siting with the historic multifacility situation in Israel, which reveals that the establishment of a single centralized landfill has the potential of increasing the annual welfare produced by housing services in the region by \$1.4 billion (5 percent of the region's surplus from housing services). In other words, the environmental damage caused by the 350 landfills which exist in Israel as of 1997 is huge, but most of it can be remedied by a wise siting policy.

C. *The Political Arena*

We begin by simulating circumstances that are favorable to the political solution, where all private landowners in the region form political lobbies. We then proceed with a more challenging test, examining a situation in which lobbies are concentrated in only one metropolis. In addition, we explore empirically the influence of equity in property distribution and of politicians' ethics on the siting policies.

A determination of the political equilibrium requires knowledge of γ and the distributions of β^i and ν^i. To this end, we assume naturally that

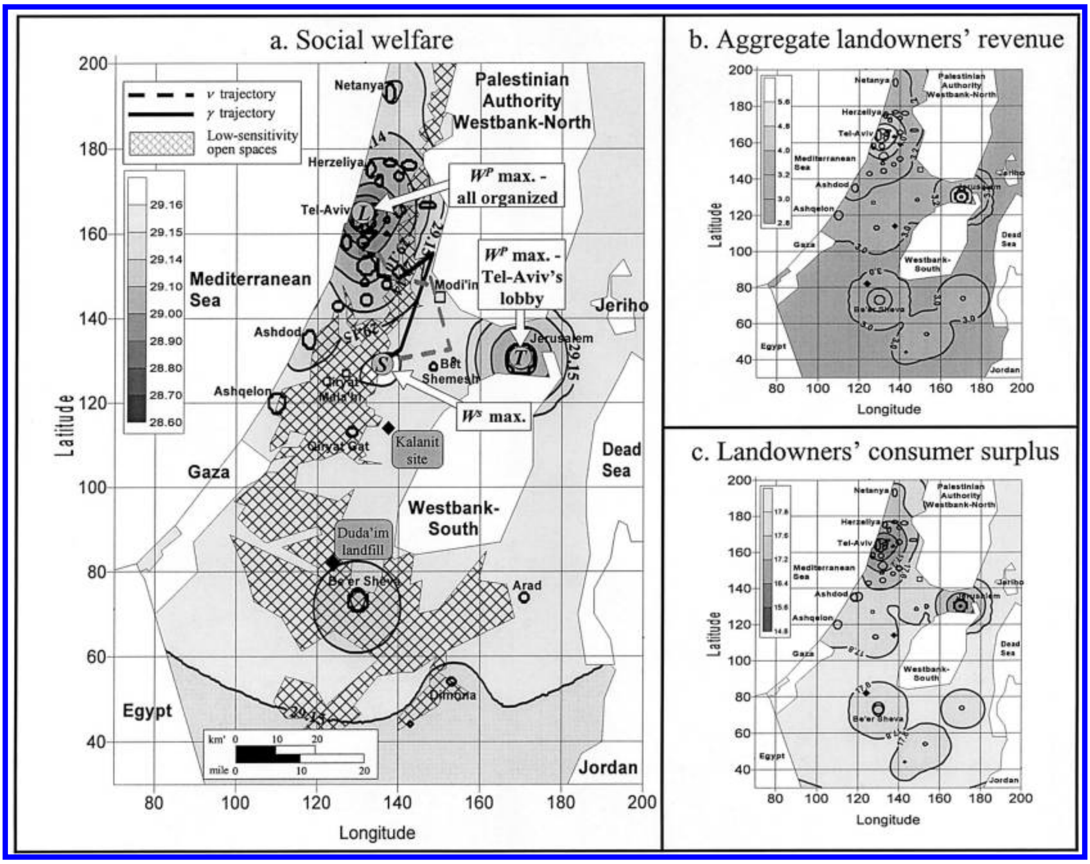

FIGURE 1. WELFARE CONSEQUENCES OF SITING (BILLIONS OF 1997 U.S. $)

all private landowners participate in lobbies, whereas public housing companies are not engaged in the political arena. This implies that β^i, $i \in (1, \dots, 33)$, equals the proportion of privately owned land in each city, and that ν^i, $i \in (1, \dots, 33)$, equals the number of private landowners who reside in each city. Both types of information are published by Israel's Central Bureau of Statistics and are reported in the last two columns of Table 1. The political objective function is then given by $W^P = (1 - \gamma)W^S + \gamma \sum_{i=1}^{33} W^i$, where

$$(20) \quad W^i = \beta^i S^i p^i + \nu^i \Bigg[30{,}003 - 74.54 r(x) + 0.0463 r(x)^2 - \frac{1.5 \times 10^{-6}}{980{,}065} \sum_{i=1}^{33} S^i d^i \Bigg].$$

Given the actual holding distribution in Israel, we find that the distance between the socially optimal and political equilibrium locations depends crucially on the politicians' ethical norms, γ. Governmental ethics are expected to vary considerably across countries and time. Accordingly, we simulate equilibria for a range of values of γ. The black line in Figure 1a describes the trajectory of the landfill political-equilibrium location as γ ranges from 1 to 0. Figure 2a depicts the associated welfare consequences. Starting with the extreme case, where $\gamma = 1$, the politicians' objective function coincides with the lobbies' aggregate welfare and the single landfill is located at point L near Tel Aviv. This location near the largest city in the region diminishes annual welfare by about \$1.04 billion, or 3.6 percent of the attainable economic surplus in the housing market. Nevertheless, even from society's point of view, the

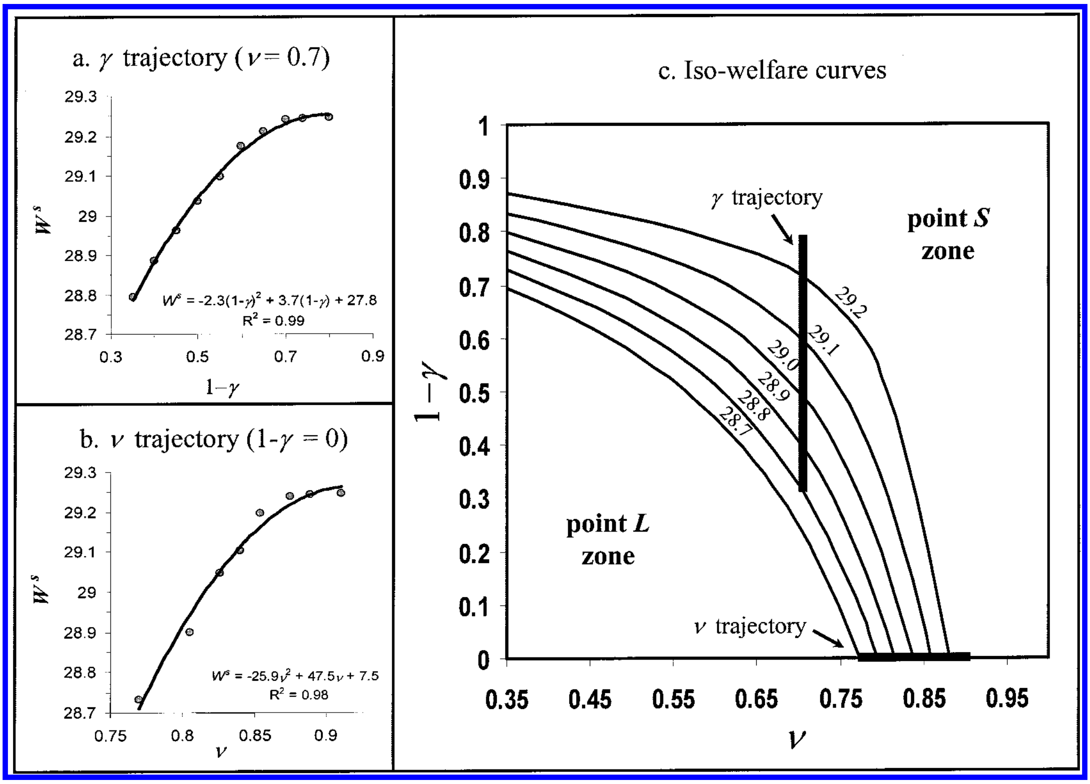

FIGURE 2. VARIATION OF SOCIAL WELFARE (BILLIONS OF 1997 U.S. $)

establishment of a single landfill at point *L* is still preferable by \$0.36 billion to the multilandfill situation.

To explain the reason for this location (point *L*), we first suppose that all landowners are absentees. In this case, the lobbies care only about housing revenue, and the political objective function coincides with the aggregate profit of a hypothetical regional landowners cartel. Recalling that the demand elasticity, η^D, equals 0.3, it is clear that such a cartel would strive to reduce aggregate housing supply in order to increase housing prices and revenues. Since housing supply is fixed, the available technology to lessen the "effective housing supply" is to locate the facility near concentrated residential areas. Such siting leads to a large negative environmental impact of the landfill and diminishes effective housing services.

Indeed, as can be seen in Figure 1b, the aggregate annual housing rent reaches its maximum of \$6.4 billion, when the landfill is adjacent to Tel Aviv, the largest metropolis in the region. In Israel, however, about 70 percent of residents are home owners. Therefore, in addition to revenue, they also care about consumer surplus, which is maximized in locations far from Tel Aviv, as can be seen in Figure 1c. However, since the topography of consumer surplus (Figure 1c) is flatter than the terrain of revenues (Figure 1b), the latter dominates and the maximum of the sum is achieved at point *L*. As the level of politicians' ethics increases, the landfill will gradually approach the socially optimal location along the black line. Inspection of Figure 2a, which presents the associated welfare implications, reveals that social welfare is a decreasing parabolic function of γ. We find that the elasticity of social welfare in the politicians' ethical norms is in the range of 0.004–0.05.

The million-dollar question is where the single landfill will actually be located. To answer it, we examine some plausible estimates of γ from previous studies. We have three relevant references. Zusman (1976) and Zusman and Amotz Amiad (1977) examine Israeli government intervention in the sugar and dairy industries and report $0.4 \leq \gamma \leq 0.6$. Recently, Pinelopi K. Goldberg and Giovanni Maggi (1999) analyzed the U.S. federal government trade policies and estimated a smaller γ (by an order of magnitude), in the range $0.014 \leq \gamma \leq 0.019$.

Adopting the recent estimates from the United States, we find that the political-equilibrium site coincides with the socially optimal location. Furthermore, as can be seen from Figure 2a, as long as $(1 - \gamma) \geq 0.7$, the annual welfare loss associated with the political process is negligible—less than \$20 million (about 0.06 percent). Even if we adopt Zusman's and Zusman and Amiad's extreme estimates ($\gamma = 0.6$), political lobbying entails only a moderate loss in welfare, less than 1.2 percent of the maximal social welfare.

Zusman (1976) and Zusman and Amiad (1977) infer estimates from data on the governmental support of Israeli agriculture during the 1970's an era characterized by domination of the agricultural sector in the Israeli political system, as is evident from the fact that 30 percent of government ministers were residents of agricultural communities, whose share in the population was only 8 percent. Thus, it is safe to infer that their estimates provide an upper bound to the actual weight that current politicians place on lobbies' welfare. Accordingly, we conclude that: *even if lobby formation among the affected communities is effective, unless politicians are extremely corrupt, the political-equilibrium site will not deviate significantly from the socially optimal one.*

Higher moral standards among politicians increase the weight of social welfare in the political-objective function. Below we demonstrate that equity in the regional holding distribution is another factor that can bring the political siting closer to the optimal one. The mechanism is simple. The higher the equity or, equivalently, the more landowners reside in the region, the larger the weight of consumer surplus in the lobbies' objective function and, indirectly, the larger is its weight in the political-objective function. But, ceteris paribus, the larger the weight given to consumer surplus, the smaller the deviation of the political-equilibrium site from the optimal one.

To quantify the impact of the distribution of landownership on social efficiency of the siting policies, we assume $\gamma = 1$ (corrupt politicians) and simulate a sequence of political equilibria for a range of $\nu = \frac{\sum_{i=1}^{33} \nu^i}{N}$. In the extreme case of inequitable ownership, none of the region's residents are home owners and all private landowners are absentees, i.e., $\nu^i = 0 \ \forall \ i$. As pointed out, in this case the political objective function coincides with the landowners' aggregate revenues, and the landfill is located at point L in Figure 1a. As ν increases, the distribution of landownership becomes more equitable and the landfill progressively shifts closer to point S, along the dashed gray trajectory in Figure 1a.

The consequent changes in social welfare, described in Figure 2b, exhibit a positive parabolic relation between W^s and ν, and the implied elasticity is in the range of 0.03–0.20. Currently, in Israel, $\nu = 0.72$, and with $\gamma = 1$ the political equilibrium site is L. However, we find that if ν increases above 0.85, annual welfare losses diminish dramatically to \$83 million, constituting but 0.3 percent of total surplus. An international comparison of developed countries reveals that the rate of home ownership ranges from 0.2 in Switzerland to 0.8 in Italy. Thus, we conclude that the levels of equity that are required to offset the ill effect of completely corrupt politicians are above those found in most developed countries.

The above analysis suggests, however, an interesting insight concerning the trade-off between equity and morality that will lead to effective functioning of the political system. Figure 2c depicts the map of welfare isoquants in the (ν, γ) space. It can be seen that if $\gamma \leq 0.2$, then a moderate degree of equity of $\nu \geq 0.5$ will result in an efficient political solution, with annual welfare losses of less than \$50 million (0.2 percent). Recalling that $\gamma = 0.2$ is larger by an order of magnitude than recent estimates from the United States, and that the condition of $\nu \geq 0.5$ is met by most developed countries, including the United States, we conclude that for the range of parameters found in many of the developed democracies, the political process provides a reasonable solution to the NIMBY conflict.

To examine the robustness of this conclusion, we conduct a sensitivity analysis with respect to variations in the value of the housing-price elasticity and the form of the demand function. We find that the larger $\hat{\eta}^D$, the closer Point L is to Point S; and if $\hat{\eta}^D \geq 0.6$, the two points coincide, implying that for any level of γ and ν the political equilibrium location is optimal. Moreover, Ruijue Peng and William C. Wheaton (1994) report that in many developed countries the housing demand is more elastic than in Israel, strengthening our conclusion.

How restrictive is the linearity of the demand function? To answer this we employ a Box-Cox transformation: $D(r) = A - B\frac{r^{\lambda} - 1}{\lambda}$. Repeated runs of the model, where λ varies between 1 (a linear demand) and 0 (a logarithmic demand) reveal that the smaller the value of λ, the smaller the deviation between points L and S. Therefore, the linear demand function appears to be the most challenging specification with respect to our hypothesis.[2]

Note that the foregoing results demonstrate that although interest groups invest resources in lobbying, they eventually create only minor deviations in policy from the socially optimal ones. This is to say, if interest groups in the various cities could operate cooperatively, they would probably decide to stay out of the political process and save the political contributions. However, in reality, such cooperation is unlikely. Therefore, each of the lobbies must be active and make a contribution designed to nudge the government to choose a location more favorable to itself. If a specific lobby were to become inactive, it may find the politically determined location of the noxious facility in its backyard, as demonstrated in the next simulation.

Specifically, we simulate a situation in which only private landowners in the city of Tel-Aviv and its neighboring cities (marked with an asterisk in Table 1) are organized into politically active lobbies. The total welfare of the lobbies' members is maximized when the landfill is sited near the center of the other most populated city, Jerusalem (point T, Figure 1a). From the lobby members' point of view, this is the best way to reduce supply of housing services and so increase r and their own revenues. The annual social welfare obtained in that location, W^S, is lower by \$686 million (2.35 percent) than the value obtained under socially optimal siting. The location determined in the political arena, however, is the one which maximizes the weighted sum of the lobby welfare and the social welfare. We find that if γ exceeds 0.7, then the political siting is still geographically very close to the optimal site, and the welfare losses are negligible. This result strengthens our belief that the political process functions effectively, even if the political organization is imperfect and lobby formation is incomplete.

Recently, while revising this paper, we learned that the Israeli National Board for Planning and Building has decided to site the new central landfill at Kalanit, not far from the city of Qiryat Gat. This site is only 10 km (6 miles) from our deduced optimal location.

[2] Values of λ greater than 1 result in housing-price elasticities that are smaller than any estimate reported in the literature.

REFERENCES

Bar-Nathan, Moshe; Beenshtock, Michael and Haitovsky, Yoel. "The Market for Housing in Israel." *Regional Science and Urban Economics*, January 1998, *28*(1), pp. 21–49.

Environmental Management and Consulting. "External and Direct Costs of Waste Disposal in Israel." A Special Report Submitted to the Ministries of Interior and Environmental Quality, 1996.

Farber, Stephen. "Undesirable Facilities and Property Values: A Summary of Empirical Studies." *Ecological Economics*, January 1998, *24*(1), pp. 1–14.

Feitelson, Eran. "Malicious Siting or Unrecognized Processes? A Spatio-Temporal Analysis of Environmental Conflicts in Tel Aviv." *Urban Studies*, February 2001, *38*(7), pp. 1143–59.

Finkelshtain, Israel and Kislev, Yoav. "Prices Versus Quantities: The Political Perspective." *Journal of Political Economy*, February 1997, *105*(1), pp. 83–100.

Frey, Bruno S.; Oberhoizer-Gee, Felix and Eichenberger, Reiner. "The Old Lady Visits Your Backyard: A Tale of Morals and Markets." *Journal of Political Economy*, December 1996, *104*(6), pp. 1297–313.

Goldberg, Pinelopi K. and Maggi, Giovanni. "Protection for Sale: An Empirical Investigation."

American Economic Review, December 1999, *89*(5), pp. 1135–55.

Goren, Tamir. "Evaluation of the External Cost Associated with Waste Treatment Facilities." M.Sc. dissertation, The Hebrew University of Jerusalem, January 1997.

Grossman, Gene M. and Helpman, Elhanan. "Protection for Sale." *American Economic Review*, September 1994, *84*(4), pp. 833–50.

Kunreuther, Howard and Kleindorfer, Paul R. "A Sealed-Bid Auction Mechanism for Siting Noxious Facilities." *American Economic Review*, May 1986 (*Papers and Proceedings*), *76*(2), pp. 295–99.

Minehart, Deborah and Neeman, Zvika. "Effective Siting of Waste Treatment Facilities." *Journal of Environmental Economics and Management*, March 2002, *43*(2), pp. 303–24.

Mitchell, Robert C. and Carson, Richard T. "Property Rights, Protest, and the Siting of Hazardous Waste Facilities." *American Economic Review*, May 1986 (*Papers and Proceedings*), *76*(2), pp. 285–90.

Mitra, Devashish. "Endogenous Lobby Formation and Endogenous Protection: A Long-Run Model of Trade Policy Determination." *American Economic Review*, December 1999, *89*(5), pp. 1116–34.

O'Sullivan, Arthur. "Voluntary Auctions for Noxious Facilities: Incentives to Participate and the Efficiency of Siting Decisions." *Journal of Environmental Economics and Management*, July 1993, *25*(1), pp. S12–S26.

Peng, Ruijue and Wheaton, William C. "Effects of Restrictive Land Supply on Housing in Hong Kong: An Econometric Analysis." *Journal of Housing Research*, May 1994, *5*(2), pp. 263–91.

Shmueli, Deborah and Gasul, Dalit. "Conflict Assessment: Duda'im Landfill." *Conflict in Planning, Development and Environment*. Ministry of Environmental Quality, Planning Division, State of Israel, January 1999.

Swallow, Stephen K.; Opaluch, James J. and Weaver, Thomas F. "Siting Noxious Facilities: An Approach That Integrates Technical, Economic and Political Considerations." *Land Economics*, August 1992, *68*(3), pp. 283–301.

Zusman, Pinhas. "The Incorporation and Measurement of Social Power in Economic Models." *International Economic Review*, June 1976, *17*(2), pp. 477–62.

Zusman, Pinhas and Amiad, Amotz. "A Quantitative Investigation of a Political Economy—The Israeli Dairy program." *American Journal of Agricultural Economics*, February 1977, *59*(1), pp. 88–98.

This article has been cited by:

1. Gabriel M. Ahlfeldt, Wolfgang Maennig, Steffen Q. Mueller. 2022. The generation gap in direct democracy: Age vs. cohort effects. *European Journal of Political Economy* **72**, 102120. [Crossref]
2. Sen Eguchi. Effects of Nominating an Area as the Candidate Place of a New NIMBY Facility: A Consideration 89-99. [Crossref]
3. Doron Lavee. Policy Tools to Promote Environmental Quality in Israel: A Comparison of Economic Tools with Direct Regulation 587-606. [Crossref]
4. Doron Lavee. 2020. Are Economic Tools Preferable to Direct Regulatory Measures in Achieving Environmental Goals?. *Environmental Policy and Law* **50**:3, 181-191. [Crossref]
5. Sen Eguchi. 2020. NIMBY (not in my backyard) conflicts: a simple game-theoretic analysis. *Asia-Pacific Journal of Regional Science* **4**:3, 821-833. [Crossref]
6. Yehonatan Givati, Yotam Kaplan. 2020. Harm Displacement and Tort Doctrine. *The Journal of Legal Studies* **49**:1, 73-101. [Crossref]
7. Gabriel M. Ahlfeldt, Wolfgang Maennig, Malte Steenbeck. 2020. Direct democracy and intergenerational conflicts in ageing societies. *Journal of Regional Science* **60**:1, 129-155. [Crossref]
8. Yuichi Ishimura, Kenji Takeuchi. 2019. The spatial concentration of waste landfill sites in Japan. *Resource and Energy Economics* **58**, 101121. [Crossref]
9. Sen Eguchi. 2019. Why are NIMBY Problems Difficult to Be Resolved ?: A Theoretical Investigation. *Studies in Regional Science* **49**:1, 95-111. [Crossref]
10. Jang Hee Min, Woosik Jang, Seung Heon Han, Doyun Kim, Young Hoon Kwak. 2018. How Conflict Occurs and What Causes Conflict: Conflict Analysis Framework for Public Infrastructure Projects. *Journal of Management in Engineering* **34**:4. . [Crossref]
11. Nikolas Lührs, Nicolas W. Jager, Edward Challies, Jens Newig. 2018. How Participatory Should Environmental Governance Be? Testing the Applicability of the Vroom-Yetton-Jago Model in Public Environmental Decision-Making. *Environmental Management* **61**:2, 249-262. [Crossref]
12. Juan Ignacio Alcaide, Emilio Rodríguez-Díaz, Francisco Piniella. 2017. European policies on ship recycling: A stakeholder survey. *Marine Policy* **81**, 262-272. [Crossref]
13. Guy-El-Karim Berthomé, Alban Thomas. 2017. A Context-based Procedure for Assessing Participatory Schemes in Environmental Planning. *Ecological Economics* **132**, 113-123. [Crossref]
14. Riccardo Ghidoni. 2017. Mistrust and Opposition to Large-Scale Projects: An Experiment on the Role of Uncertainty. *SSRN Electronic Journal* **18**. . [Crossref]
15. Michal Nový. 2016. Explaining turnout in local referenda in the Czech Republic: does a NIMBY question enhance citizen engagement?. *East European Politics* **32**:4, 487-504. [Crossref]
16. Laura Abrardi, Luca Colombo, Pier Angelo Mori. 2016. CUSTOMER OWNERSHIP AND QUALITY PROVISION IN PUBLIC SERVICES UNDER ASYMMETRIC INFORMATION. *Economic Inquiry* **54**:3, 1499-1518. [Crossref]
17. Laura Abrardi, Luca Colombo, Pier Angelo Mori. 2014. Costumer Ownership and Quality Provision in Public Services under Asymmetric Information. *SSRN Electronic Journal* **76**. . [Crossref]
18. Byung Duk Song, James R. Morrison, Young Dae Ko. 2013. Efficient location and allocation strategies for undesirable facilities considering their fundamental properties. *Computers & Industrial Engineering* **65**:3, 475-484. [Crossref]
19. Matthias Cinyabuguma, Virginia McConnell. 2013. URBAN GROWTH EXTERNALITIES AND NEIGHBORHOOD INCENTIVES: ANOTHER CAUSE OF URBAN SPRAWL?*. *Journal of Regional Science* **53**:2, 332-348. [Crossref]

20. Bert Saveyn. 2013. On NIMBY and commuting. *International Tax and Public Finance* **20**:2, 293-311. [Crossref]

21. Giorgio Bellettini, Hubert Kempf. 2013. Why not in your backyard? On the location and size of a public facility. *Regional Science and Urban Economics* **43**:1, 22-30. [Crossref]

22. Paola Garrone, Angelamaria Groppi. 2012. Siting locally-unwanted facilities: What can be learnt from the location of Italian power plants. *Energy Policy* **45**, 176-186. [Crossref]

23. Gabriel Ahlfeldt, Wolfgang Maennig. 2012. Voting on a NIMBY Facility. *Urban Affairs Review* **48**:2, 205-237. [Crossref]

24. Giuseppe Pignataro, Giovanni Prarolo. 2012. One More in My Backyard? Insights from the 2011 Italian Nuclear Referendum. *SSRN Electronic Journal* **63**. . [Crossref]

25. Angelamaria Groppi, Paola Garrone. 2011. Siting of Locally-Unwanted Energy Facilities: What Can Be Learnt from the Location of Italian Power Plants. *SSRN Electronic Journal* **31**. . [Crossref]

26. Chae Kyung Suk. 2010. A Comparative Study on the Policy Acceptance of Noxious Facilities and Conflict Management. *Public Policy Review* **24**:2, 31-54. [Crossref]

27. Iddo Kan, Ofira Ayalon, Roy Federman. 2010. On the efficiency of composting organic wastes. *Agricultural Economics* **41**:2, 151-163. [Crossref]

28. Paola Garrone, Angelamaria Groppi. 2010. Siting Permits between Environmental Concerns and Voice Effects: Evidence from Italian Power Generation, 1999-2007. *SSRN Electronic Journal* **jou_vol[1].xmlText**. . [Crossref]

29. David Schelly, Paul B. Stretesky. 2009. An Analysis of the "Path of Least Resistance" Argument in Three Environmental Justice Success Cases. *Society & Natural Resources* **22**:4, 369-380. [Crossref]

30. Nathalie Gaussier. 2007. Gravitational perspectives in garbage dump siting. *The Annals of Regional Science* **41**:3, 657-672. [Crossref]

31. Richard Benjamin, Jeffrey Wagner. 2006. Reconsidering the law and economics of low-level radioactive waste management. *Environmental Economics and Policy Studies* **8**:1, 33-53. [Crossref]

32. Mary Riddel, R. Keith Schwer. 2006. Winners, Losers, and the Nuclear-Waste Dilemma. *Environmental & Resource Economics* **34**:2, 317-338. [Crossref]

33. Bert Saveyn. 2006. Are NIMBYs Commuters?. *SSRN Electronic Journal* **34**. . [Crossref]

34. Giorgio Bellettini, Hubert Kempf. 2006. Why Not in Your Backyard? On the Location and Size of a Public Facility. *SSRN Electronic Journal* **101**. . [Crossref]